

SEQUENCE LISTING

<110> Narva, Kenneth
Merlo, Donald

<120> Polynucleotides, Pesticidal Proteins, and Novel Methods of Using Them

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<151> 2001-05-07

<150> US 09/073,898
<151> 1998-05-06

<150> US 08/690,780
<151> 1997-10-30

<150> US 60/029,848
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| cttattaact ctacacttac tgaaattaca cctgcgtatc aaaggattaa atatgtgaac | 540 |
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| tctcctgcaa atattcttga tgagttaact gagttaactg aactagcgaa aagtgttaaca | 660 |
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Gly Ile Leu Lys Gln Asn Leu Gln Leu Asp Ser Phe Ser Thr Tyr Arg
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675 680 685

Ser Thr Asn Ile Ser Gly Asn Thr Leu Thr Leu Tyr Gln Gly Gly Arg
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Gly Ile Leu Lys Gln Asn Leu Gln Leu Asp Ser Phe Ser Thr Tyr Arg
705 710 715 720

Val Tyr Phe Ser Val Ser Gly Asp Ala Asn Val Arg Ile Arg Asn Ser
725 730 735

Arg Glu Val Leu Phe Glu Lys Arg Tyr Met Ser Gly Ala Lys Asp Val
740 745 750

Ser Glu Met Phe Thr Thr Lys Phe Glu Lys Asp Asn Phe Tyr Ile Glu
755 760 765

Leu Ser Gln Gly Asn Asn Leu Tyr Gly Gly Pro Ile Val His Phe Tyr
770 775 780

Asp Val Ser Ile Lys Pro
785 790

<210> 9
<211> 47
<212> DNA
<213> Artificial Sequence

<220>
<223> 158C2 Primer A

<400> 9
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<210> 10
<211> 2035
<212> DNA
<213> Bacillus thuringiensis

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atacaggtgg taatctaacc ttagacgaaa tcctaaagaa tcagcagtta cttaatgaga 180
tttctggtaa attggatggg gtaaatggga gcttaaataga tcttatcgca cagggaaact 240
taaatacaga attagctaag caaatcttaa aagttgcaaa tgaacaaaat caagttttta 300
atgatgttaa taacaaacta gactgcgata aatacgatgc ttaaaatata tctacctaaa 360

| | |
|--|------|
| attcacatct atgttaagtg atgtactgaa gccaaaatta tgtgcttaag tcttgcaa | 420 |
| tggaattacc ttttaagtaac atctgcacct tggcaagaaa tctccgacaa gctagatatt | 480 |
| attaacgtaa atgtgcttat taactctacg cttactgaaa ttacacctgc gtatcaacga | 540 |
| attaaatatg tgaatgaaaa atttgacgat ttaacttttg ctacagaaaa cactttaaaa | 600 |
| gtaaaaaagg atagctctcc tgctgatatt cttgacgagt taactgaatt aactgaacta | 660 |
| gcgaaaagtg ttacaaaaaa tgacgtggat gggtttgaat ttaccttaa tacattccat | 720 |
| gatgtaatgg tgggaaataa tttattcggt cggttcagctt taaaaactgc ttcggaatta | 780 |
| attgctaaag aaaatgtgaa aacaagtggc agtgaagtag gaaatgttta taatttctta | 840 |
| attgtattaa cagctctaca agcaaaagct tttcttactt taacaacatg ccgaaaatta | 900 |
| ttaggcttag cagatattga ttatacttct atcatgaatg agcattttaa taaggaaaaa | 960 |
| gaggaattta gagtaaacad ccttcccaca ctttctaata ctttttctaa tctaattat | 1020 |
| gcaaaagcta agggaagtaa tgaagataca aagatgattg tggaagctaa accaggatat | 1080 |
| gttttggttg gatttgaaat gagcaataat tcaattacag tattaaaagc atatcaagct | 1140 |
| aagctaaaaa aagattatca aattgataag gattcgttat cagaaataat atatagtacg | 1200 |
| tgatacggat aaattattat gtccggatca atctgaacaa tatattatac aaagaacata | 1260 |
| gcattttcaa atgaatatgt tattactaaa attgctttta ctaaaaaaat gaacagttta | 1320 |
| aggtagagg cgacagcgaa tttttatgat tcttctacag gggatattga tctaaataag | 1380 |
| acaaaagtag aatcaagtga agcggagtat agtatgctaa aagctagtga tgatgaagtt | 1440 |
| tacatgccgc taggtcttat cagtgaacaa tttttaaatc caattaatgg atttaggctt | 1500 |
| gcagtcgatg aaaattccag actagtaact ttaacatgta gatcatattt aagagagaca | 1560 |
| ttgttagcga cagattttaa taataaagaa actaaattga ttgtcccacc taatgttttt | 1620 |
| attagcaata ttgtagagaa tggaaatata gaaatggaca ccttagaacc atggaaggca | 1680 |
| aataatgaga atgcgaatgt agattattca ggcggagtga atggaactag agctttatat | 1740 |
| gttcataagg atggtgaatt ctcacatttt attggagaca agttgaaatc taaaacagaa | 1800 |
| tacttgattc gatatatgtg aaaaggaaaa gcttctattt ttttaaaga tgaaagaaat | 1860 |
| gaaaattaca tttacgagga tacaataat aatttagaag attatcaaac tattactaaa | 1920 |
| cgttttacta caggaactga ttcgacagga ttttatttat tttttactac tcaagatgga | 1980 |
| aatgaagctt ggggagacac tttttttctc tagaaagagg taacttatga acaag | 2035 |

<210> 11
 <211> 21
 <212> DNA
 <213> Artificial Sequence

<220>

<223> 49C Primer A

<400> 11

catcctccct acactttcta a

21

<210> 12
 <211> 950
 <212> DNA
 <213> *Bacillus thuringiensis*

<400> 12

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| aaactagagg gagtgataag gatgcgaaaa tcattatgga agctaaacct ggatatgctt | 60 |
| tagttggatt tgaaataagt aaggattcaa ttgcagtatt aaaagtttat caggcaaagc | 120 |
| taaaacacaa ctatcaaatt gataaggatt cgttatcaga aattgtttat ggtgatatag | 180 |
| ataaattatt atgtccggat caatctgaac aaatgtatta taaaaataaa atagcatttc | 240 |
| caaatgaata tgttatcact aaaattgctt ttactaaaaa actgaacagt ttaagatatg | 300 |
| aggtcacagc gaatttttat gactcttcta caggagatat tgatctaaat aagaaaaaaa | 360 |
| tagaatcaag tgaagcggag tttagtatgc taaatgctaa taatgatggg gtttatatgc | 420 |
| cgataggtac tataagtga acatttttga ctccaattaa tggatttggc ctcgtagtcg | 480 |
| atgaaaattc aagactagta actttgacat gtaaatacata tttaagagag acattgttag | 540 |
| caacagactt aagtaataaa gaaactaaac tgattgtccc acctaatggg tttattagca | 600 |
| atattgtaga aaatgggaac ttagagggag aaaacttaga gccgtgggaa agcaaataac | 660 |
| aaaaatgcgt atgtagatca taccggagggt gtaaattgaa ctaaagtttt atatgttcat | 720 |
| gaggatgggtg agttctcaca atttattggg gataaattga aattgaaaac agaatatgta | 780 |
| attccatata ttgtaaagg gaaagctgct atttatttaa aagatgaaaa aaatggggat | 840 |
| tacatatcat gaagaaacat cataatgcaa ttgaagattt ttccagctgt aacttcaata | 900 |
| atgattttcg catccttctc atccctctag ctttttcata ataggataga | 950 |

<210> 13
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>

<223> 49C Primer B

<400> 13

aaattatgcg ctaagtctgc

20

<210> 14

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> 49C Primer C

<400> 14

ttgatccgga cataataat

19

<210> 15

<211> 176

<212> DNA

<213> Bacillus thuringiensis

<400> 15

gtaaattatg cgctaagtct gcaccttttt tcaactgttac taaacatcac ttttcctata 60

tccccttagc tcttatggat tattgagcaa acttatcttg ttaattacta ctccccatca 120

tatgctaaac aaaaacccaaa caaacattat ctattatatg tccggatcaa aatgta 176

<210> 16

<211> 2361

<212> DNA

<213> Bacillus thuringiensis

<400> 16

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ggaatttacg gattcgccac tggatcaaaa gatattatga acatgatttt taaaacgaat 120

acaggagggg atctaaccctt agacgaaata ttaaaaaatc aacagttact taatgagatt 180

tctggcaaac tggatggagt gaatggcagc ttaaatgatc ttctcgaca aggaaacttg 240

gatactgaat tatctaagga aatattaaaa attgcaaatg aacagaataa ggttttaaat 300

gatgtaaata caaagcttga tgcgataaat ttaatgctta acacatattt acctaaaatt 360

acttctatgt taagtgatgt aatgaaacaa aattatgcat taggtttgca aatagaatac 420

ctaagcaaac aattaaagga aatttcagat aagctagatg ttattaatgt aaatgtactc 480

attaactcta cacttactga aattacacct gcctatcaaa ggattaaata tgtaaatgaa 540

aaatttgaag cattaacctc tgctacagaa accaatttaa aaacaaaaca agatagctct 600

| | |
|--|------|
| catacagata ttcttgatga gttaacagag ctaacggaac tagcgaaaag tgtaacaaaa | 660 |
| aatgacgtgg atggctttga attttacctt aatacattcc acgatgtaat gattgggaat | 720 |
| aatctatttg gacgttcagc tttaaaaaca gcctcggaat taattgcgaa agaaaatttg | 780 |
| aaaacaagtg gcagtgaggt aggaaatggt tataatttct taattgtatt aacagctctg | 840 |
| caagcaaaag cttttcttac ttttaactaca tgccggaaat tattgggctt agcagatatt | 900 |
| gattatactc ctattatgaa tgaacaccta aataaagaaa aagaggaatt tagagtgaac | 960 |
| atccttcta cactttctaa tactttttct aatcctaatt atgaaaaagc tagagggagt | 1020 |
| gataaggatg cgaaaatcat tatggaagct aaacctggat atgctttagt tggatttgaa | 1080 |
| ataagtaagg attcaattgc agtattaaaa gtttatcagg caaagctaaa acacaactat | 1140 |
| caaattgata aggattcggt atcagaaatt gtttatgggtg atatagataa attattatgt | 1200 |
| ccggatcaat ctgaacaaat gtattataca aataaaatag catttccaaa tgaatatgtt | 1260 |
| atcactaaaa ttgcttttac taaaaaactg aacagtttaa gatatgaggt cacagcgaat | 1320 |
| ttttatgact cttctacagg agatattgat ctaaataaga aaaaaataga atcaagtga | 1380 |
| gcggagttta gtatgctaaa tgctaataat gatgggtgtt atatgccgat aggtactata | 1440 |
| agtgaacat ttttgactcc aattaatgga tttggcctcg tagtcgatga aaattcaaga | 1500 |
| ctagtaactt tgacatgtaa atcatattta agagagacat tgtagcaac agacttaagt | 1560 |
| aataaagaaa ctaaactgat tgtccacct aatggtttta ttagcaatat tgtagaaaat | 1620 |
| gggaacttag agggagaaaa cttagagccg tggaaagcaa ataacaaaaa tgcgtatgta | 1680 |
| gatcataccg gaggtgtaaa tggaactaaa gttttatatg ttcatgagga tggtgagttc | 1740 |
| tcacaattta ttggggataa attgaaattg aaaacagaat atgtaattca atatattgta | 1800 |
| aagggaaaag ctgctattta tttaaaagat gaaaaaatg gggattacat ttatgaagaa | 1860 |
| acaaataatg aattagaaga ttttcaagct gtactaaac gttttattac gggaacagat | 1920 |
| tcttcaagag ttcatttaat ttttaccagt caaatggcg aggaagcatt tggaggaaac | 1980 |
| tttattattt cagaaattag gccatccgaa gagttattaa gtccagaatt gattaagtcg | 2040 |
| gatgcttggg ttggatctca gggaacttgg atctcaggaa attctctcaa tattaatagt | 2100 |
| aatgtaaatg gaacctttcg acaaacctt tcgttagaaa gttattcaac ctatagtatg | 2160 |
| aactttaatg tgaatggatt tggcaaggtg acaataagaa attctcgtga agtagtattt | 2220 |
| gaaaggagtt atctacagtt ttcctctaaa tatatttcag aaaaattcac aacaacaacc | 2280 |

aataatactg gggtatatgt agaactttct cgtgcttcgt ctaggggagt tataaatttc 2340

ggagattttt caatcaagta a 2361

<210> 17

<211> 786

<212> PRT

<213> *Bacillus thuringiensis*

<400> 17

Met Gln Lys Asn Asn Lys Leu Ser Val Lys Ala Leu Pro Ser Phe Ile
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Asp Tyr Phe Asn Gly Ile Tyr Gly Phe Ala Thr Gly Ile Lys Asp Ile
20 25 30

Met Asn Met Ile Phe Lys Thr Asn Thr Gly Gly Asp Leu Thr Leu Asp
35 40 45

Glu Ile Leu Lys Asn Gln Gln Leu Leu Asn Glu Ile Ser Gly Lys Leu
50 55 60

Asp Gly Val Asn Gly Ser Leu Asn Asp Leu Leu Ala Gln Gly Asn Leu
65 70 75 80

Asp Thr Glu Leu Ser Lys Glu Ile Leu Lys Ile Ala Asn Glu Gln Asn
85 90 95

Lys Val Leu Asn Asp Val Asn Thr Lys Leu Asp Ala Ile Asn Leu Met
100 105 110

Leu Asn Thr Tyr Leu Pro Lys Ile Thr Ser Met Leu Ser Asp Val Met
115 120 125

Lys Gln Asn Tyr Ala Leu Gly Leu Gln Ile Glu Tyr Leu Ser Lys Gln
130 135 140

Leu Lys Glu Ile Ser Asp Lys Leu Asp Val Ile Asn Val Asn Val Leu
145 150 155 160

Ile Asn Ser Thr Leu Thr Glu Ile Thr Pro Ala Tyr Gln Arg Ile Lys
165 170 175

Tyr Val Asn Glu Lys Phe Glu Ala Leu Thr Ser Ala Thr Glu Thr Asn
 180 185 190

Leu Lys Thr Lys Gln Asp Ser Ser His Thr Asp Ile Leu Asp Glu Leu
 195 200 205

Thr Glu Leu Thr Glu Leu Ala Lys Ser Val Thr Lys Asn Asp Val Asp
 210 215 220

Gly Phe Glu Phe Tyr Leu Asn Thr Phe His Asp Val Met Ile Gly Asn
 225 230 235 240

Asn Leu Phe Gly Arg Ser Ala Leu Lys Thr Ala Ser Glu Leu Ile Ala
 245 250 255

Lys Glu Asn Leu Lys Thr Ser Gly Ser Glu Val Gly Asn Val Tyr Asn
 260 265 270

Phe Leu Ile Val Leu Thr Ala Leu Gln Ala Lys Ala Phe Leu Thr Leu
 275 280 285

Thr Thr Cys Arg Lys Leu Leu Gly Leu Ala Asp Ile Asp Tyr Thr Pro
 290 295 300

Ile Met Asn Glu His Leu Asn Lys Glu Lys Glu Glu Phe Arg Val Asn
 305 310 315 320

Ile Leu Pro Thr Leu Ser Asn Thr Phe Ser Asn Pro Asn Tyr Glu Lys
 325 330 335

Ala Arg Gly Ser Asp Lys Asp Ala Lys Ile Ile Met Glu Ala Lys Pro
 340 345 350

Gly Tyr Ala Leu Val Gly Phe Glu Ile Ser Lys Asp Ser Ile Ala Val
 355 360 365

Leu Lys Val Tyr Gln Ala Lys Leu Lys His Asn Tyr Gln Ile Asp Lys
 370 375 380

Asp Ser Leu Ser Glu Ile Val Tyr Gly Asp Ile Asp Lys Leu Leu Cys
 385 390 395 400

Pro Asp Gln Ser Glu Gln Met Tyr Tyr Thr Asn Lys Ile Ala Phe Pro
 405 410 415

Asn Glu Tyr Val Ile Thr Lys Ile Ala Phe Thr Lys Lys Leu Asn Ser
 420 425 430

Leu Arg Tyr Glu Val Thr Ala Asn Phe Tyr Asp Ser Ser Thr Gly Asp
 435 440 445

Ile Asp Leu Asn Lys Lys Lys Ile Glu Ser Ser Glu Ala Glu Phe Ser
 450 455 460

Met Leu Asn Ala Asn Asn Asp Gly Val Tyr Met Pro Ile Gly Thr Ile
 465 470 475 480

Ser Glu Thr Phe Leu Thr Pro Ile Asn Gly Phe Gly Leu Val Val Asp
 485 490 495

Glu Asn Ser Arg Leu Val Thr Leu Thr Cys Lys Ser Tyr Leu Arg Glu
 500 505 510

Thr Leu Leu Ala Thr Asp Leu Ser Asn Lys Glu Thr Lys Leu Ile Val
 515 520 525

Pro Pro Asn Gly Phe Ile Ser Asn Ile Val Glu Asn Gly Asn Leu Glu
 530 535 540

Gly Glu Asn Leu Glu Pro Trp Lys Ala Asn Asn Lys Asn Ala Tyr Val
 545 550 555 560

Asp His Thr Gly Gly Val Asn Gly Thr Lys Val Leu Tyr Val His Glu
 565 570 575

Asp Gly Glu Phe Ser Gln Phe Ile Gly Asp Lys Leu Lys Leu Lys Thr
 580 585 590

Glu Tyr Val Ile Gln Tyr Ile Val Lys Gly Lys Ala Ala Ile Tyr Leu
 595 600 605

Lys Asp Glu Lys Asn Gly Asp Tyr Ile Tyr Glu Glu Thr Asn Asn Glu
 610 615 620

Leu Glu Asp Phe Gln Ala Val Thr Lys Arg Phe Ile Thr Gly Thr Asp
625 630 635 640

Ser Ser Arg Val His Leu Ile Phe Thr Ser Gln Asn Gly Glu Glu Ala
645 650 655

Phe Gly Gly Asn Phe Ile Ile Ser Glu Ile Arg Pro Ser Glu Glu Leu
660 665 670

Leu Ser Pro Glu Leu Ile Lys Ser Asp Ala Trp Val Gly Ser Gln Gly
675 680 685

Thr Trp Ile Ser Gly Asn Ser Leu Asn Ile Asn Ser Asn Val Asn Gly
690 695 700

Thr Phe Arg Gln Asn Leu Ser Leu Glu Ser Tyr Ser Thr Tyr Ser Met
705 710 715 720

Asn Phe Asn Val Asn Gly Phe Gly Lys Val Thr Ile Arg Asn Ser Arg
725 730 735

Glu Val Val Phe Glu Arg Ser Tyr Leu Gln Phe Ser Ser Lys Tyr Ile
740 745 750

Ser Glu Lys Phe Thr Thr Thr Thr Asn Asn Thr Gly Leu Tyr Val Glu
755 760 765

Leu Ser Arg Ala Ser Ser Arg Gly Val Ile Asn Phe Gly Asp Phe Ser
770 775 780

Ile Lys
785

<210> 18
<211> 2361
<212> DNA
<213> Bacillus thuringiensis

<400> 18
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aatggcattt atggatttgc cactggtatc aaagacatta tgaatatgat ttttaaacg 120
gatacaggtg gtaatctaac cttagacgaa atcctaaaga atcagcagtt actaaatgag 180
atttctggta aattggatgg ggtaaattgg agcttaaattg atcttatcgc acagggaaac 240

| | |
|---|------|
| ttaaatacag aattagctaa gcaaacttta aaagttgcaa atgaacaaaa tcaagtttta | 300 |
| aatgatgtta ataacaaact agatgcgata aattcgatgc ttaaaatata tctacctaaa | 360 |
| attacatcta tgttaagtga tgtaatgaag caaaattatg tgctaagctt gcaaatagaa | 420 |
| tacttaagta aacaattgca agaaatctcc gacaagctag atattattaa cgtaaatgtg | 480 |
| cttattaact ctacgcttac tgaaattaca cctgcgtatc aacgaattaa atatgtgaat | 540 |
| gaaaaatttg acgatttaac ttttgctaca gaaaacactt taaaagtaaa aaaggatagc | 600 |
| tctcctgctg atattcttga cgagttaact gaattaactg aactagcgaa aagtgttaca | 660 |
| aaaaatgacg tggatggttt tgaattttac cttaatacat tccatgatgt aatgggtggga | 720 |
| aataatttat tcggctcgttc agcttttaaaa actgcttcgg aattaattgc taaagaaaat | 780 |
| gtgaaaacaa gtggcagtga agtaggaaat gtttataatt tcttaattgt attaacagct | 840 |
| ctacaagcaa aagcttttct tactttaaca acatgccgaa aattattagg cttagcagat | 900 |
| attgattata cttctatcat gaatgagcat ttaaataagg aaaaagagga atttagagta | 960 |
| aacatccttc ccacactttc taataccttt tctaactcta attatgcaaa agctaaggga | 1020 |
| agtaatgaag atacaaagat gattgtggaa gctaaaccag gatatgtttt ggttggattt | 1080 |
| gaaatgagca ataattcaat tacagtatta aaagcatatc aagctaagct aaaaaaagat | 1140 |
| tatcaaattg ataaggattc gttatcagaa ataatatata gtgatacgga taaattatta | 1200 |
| tgtccggatc aatctgaaca aatatattat acaaagaaca tagcatttcc aaatgaatat | 1260 |
| gttattacta aaattgcttt tactaaaaaa atgaacagtt taaggatatga ggcgacagcg | 1320 |
| aatttttatg attcttctac aggggatatt gatctaaata agacaaaagt agaatcaagt | 1380 |
| gaagcggagt atagtatgct aaaagctagt gatgatgaag ttacatgcc gctaggtctt | 1440 |
| atcagtgaaa cattttttaa tccaattaat ggatttaggc ttgcagtcga tgaaaattcc | 1500 |
| agactagtaa ctttaacatg tagatcatat ttaagagaga cattgttagc gacagattta | 1560 |
| aataataaag aaactaaatt gattgtccca cctaattgtt ttattagcaa tattgtagag | 1620 |
| aatggaaata tagaaatgga caccttagaa ccatggaagg caaataatga gaatgcgaat | 1680 |
| gtagattatt caggcggagt gaatggaact agagctttat atgttcataa ggatggtgaa | 1740 |
| ttctcacatt ttattggaga caagttgaaa tctaaaacag aatacttgat tcgatatatt | 1800 |
| gtaaaaggaa aagcttctat ttttttaaaa gatgaaaaaa atgaaaatta catttacgag | 1860 |
| gatacaaata ataatttaga agattatcaa actattacta aacgttttac tacaggaact | 1920 |

gattcgacag gagtttattt aatttttaaat agtcaaaatg gagatgaagc ttgggggagat 1980
 aactttatta ttttggaat tagtccgtgt gaaaagttat taagtccaga attaattaaa 2040
 acagataaat ggattagtagc gggatcgact tatattagcg atgatagact cactctttat 2100
 cagggaggac gaggaatttt aaagcaaaac cttcaattag atcgtttttc aacttataga 2160
 gtcaattttt ctgtgaacgg agatgctaata gtaaggattc gtaattctag ggaagtgtta 2220
 cttgaaaaaa gatatttgaa ccgtaaaggt gtttctgaaa tgttcactac aaaatttgat 2280
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<210> 19
 <211> 786
 <212> PRT
 <213> *Bacillus thuringiensis*

<400> 19

Met Asn Met Asn Asn Thr Lys Leu Asn Ala Arg Ala Leu Pro Ser Phe
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Ile Asp Tyr Phe Asn Gly Ile Tyr Gly Phe Ala Thr Gly Ile Lys Asp
 20 25 30

Ile Met Asn Met Ile Phe Lys Thr Asp Thr Gly Gly Asn Leu Thr Leu
 35 40 45

Asp Glu Ile Leu Lys Asn Gln Gln Leu Leu Asn Glu Ile Ser Gly Lys
 50 55 60

Leu Asp Gly Val Asn Gly Ser Leu Asn Asp Leu Ile Ala Gln Gly Asn
 65 70 75 80

Leu Asn Thr Glu Leu Ala Lys Gln Ile Leu Lys Val Ala Asn Glu Gln
 85 90 95

Asn Gln Val Leu Asn Asp Val Asn Asn Lys Leu Asp Ala Ile Asn Ser
 100 105 110

Met Leu Lys Ile Tyr Leu Pro Lys Ile Thr Ser Met Leu Ser Asp Val
 115 120 125

Met Lys Gln Asn Tyr Val Leu Ser Leu Gln Ile Glu Tyr Leu Ser Lys
 130 135 140

Gln Leu Gln Glu Ile Ser Asp Lys Leu Asp Ile Ile Asn Val Asn Val
 145 150 155 160

Leu Ile Asn Ser Thr Leu Thr Glu Ile Thr Pro Ala Tyr Gln Arg Ile
 165 170 175

Lys Tyr Val Asn Glu Lys Phe Asp Asp Leu Thr Phe Ala Thr Glu Asn
 180 185 190

Thr Leu Lys Val Lys Lys Asp Ser Ser Pro Ala Asp Ile Leu Asp Glu
 195 200 205

Leu Thr Glu Leu Thr Glu Leu Ala Lys Ser Val Thr Lys Asn Asp Val
 210 215 220

Asp Gly Phe Glu Phe Tyr Leu Asn Thr Phe His Asp Val Met Val Gly
 225 230 235 240

Asn Asn Leu Phe Gly Arg Ser Ala Leu Lys Thr Ala Ser Glu Leu Ile
 245 250 255

Ala Lys Glu Asn Val Lys Thr Ser Gly Ser Glu Val Gly Asn Val Tyr
 260 265 270

Asn Phe Leu Ile Val Leu Thr Ala Leu Gln Ala Lys Ala Phe Leu Thr
 275 280 285

Leu Thr Thr Cys Arg Lys Leu Leu Gly Leu Ala Asp Ile Asp Tyr Thr
 290 295 300

Ser Ile Met Asn Glu His Leu Asn Lys Glu Lys Glu Glu Phe Arg Val
 305 310 315 320

Asn Ile Leu Pro Thr Leu Ser Asn Thr Phe Ser Asn Pro Asn Tyr Ala
 325 330 335

Lys Ala Lys Gly Ser Asn Glu Asp Thr Lys Met Ile Val Glu Ala Lys
 340 345 350

Pro Gly Tyr Val Leu Val Gly Phe Glu Met Ser Asn Asn Ser Ile Thr
 355 360 365

Val Leu Lys Ala Tyr Gln Ala Lys Leu Lys Lys Asp Tyr Gln Ile Asp
 370 375 380

Lys Asp Ser Leu Ser Glu Ile Ile Tyr Ser Asp Thr Asp Lys Leu Leu
 385 390 395 400

Cys Pro Asp Gln Ser Glu Gln Ile Tyr Tyr Thr Lys Asn Ile Ala Phe
 405 410 415

Pro Asn Glu Tyr Val Ile Thr Lys Ile Ala Phe Thr Lys Lys Met Asn
 420 425 430

Ser Leu Arg Tyr Glu Ala Thr Ala Asn Phe Tyr Asp Ser Ser Thr Gly
 435 440 445

Asp Ile Asp Leu Asn Lys Thr Lys Val Glu Ser Ser Glu Ala Glu Tyr
 450 455 460

Ser Met Leu Lys Ala Ser Asp Asp Glu Val Tyr Met Pro Leu Gly Leu
 465 470 475 480

Ile Ser Glu Thr Phe Leu Asn Pro Ile Asn Gly Phe Arg Leu Ala Val
 485 490 495

Asp Glu Asn Ser Arg Leu Val Thr Leu Thr Cys Arg Ser Tyr Leu Arg
 500 505 510

Glu Thr Leu Leu Ala Thr Asp Leu Asn Asn Lys Glu Thr Lys Leu Ile
 515 520 525

Val Pro Pro Asn Val Phe Ile Ser Asn Ile Val Glu Asn Gly Asn Ile
 530 535 540

Glu Met Asp Thr Leu Glu Pro Trp Lys Ala Asn Asn Glu Asn Ala Asn
 545 550 555 560

Val Asp Tyr Ser Gly Gly Val Asn Gly Thr Arg Ala Leu Tyr Val His
 565 570 575

Lys Asp Gly Glu Phe Ser His Phe Ile Gly Asp Lys Leu Lys Ser Lys
 580 585 590

Thr Glu Tyr Leu Ile Arg Tyr Ile Val Lys Gly Lys Ala Ser Ile Phe
 595 600 605

Leu Lys Asp Glu Lys Asn Glu Asn Tyr Ile Tyr Glu Asp Thr Asn Asn
 610 615 620

Asn Leu Glu Asp Tyr Gln Thr Ile Thr Lys Arg Phe Thr Thr Gly Thr
 625 630 635 640

Asp Ser Thr Gly Val Tyr Leu Ile Phe Asn Ser Gln Asn Gly Asp Glu
 645 650 655

Ala Trp Gly Asp Asn Phe Ile Ile Leu Glu Ile Ser Pro Cys Glu Lys
 660 665 670

Leu Leu Ser Pro Glu Leu Ile Lys Thr Asp Lys Trp Ile Ser Thr Gly
 675 680 685

Ser Thr Tyr Ile Ser Asp Asp Arg Leu Thr Leu Tyr Gln Gly Gly Arg
 690 695 700

Gly Ile Leu Lys Gln Asn Leu Gln Leu Asp Arg Phe Ser Thr Tyr Arg
 705 710 715 720

Val Asn Phe Ser Val Asn Gly Asp Ala Asn Val Arg Ile Arg Asn Ser
 725 730 735

Arg Glu Val Leu Leu Glu Lys Arg Tyr Leu Asn Arg Lys Gly Val Ser
 740 745 750

Glu Met Phe Thr Thr Lys Phe Asp Lys Asp Asn Phe Tyr Val Glu Leu
 755 760 765

Ser Gln Gly Asp Asn Leu Gly Thr Val Val His Phe Tyr Asp Phe Ser
 770 775 780

Ile Lys
 785

<210> 20

<211> 17
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> SUP-1A forward primer

<400> 20
 ggattcgta tcagaaa

17

<210> 21
 <211> 17
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> SUP-1B reverse primer

<400> 21
 ctgtygctaa caatgtc

17

<210> 22
 <211> 47
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> SUP primer

<400> 22
 gctctagaag gaggtactt atgaacaaga ataatactaa attaagc

47

<210> 23
 <211> 27
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> SUP primer

<400> 23
 ggggtacctt acttaataga gacatcg

27

<210> 24
 <211> 2364
 <212> DNA
 <213> Bacillus thuringiensis

<400> 24
 atgaatatga ataatactaa attaaacgca agggccctac cgagttttat tgattatattt

60

aatggcattt atggatttgc cactggtatc aaagacatta tgaatatgat ttttaaaacg

120

| | |
|---|------|
| gatacagggtg gtaatctaac cttagacgaa atcctaaga atcagcagtt actaaatgag | 180 |
| atttctggta aattggatgg ggtaaatggg agcttaaattg atcttatcgc acagggaaac | 240 |
| ttaaatacag aattatctaa ggaaatctta aaaattgcaa atgaacagaa tcaagtctta | 300 |
| aatgatgtta ataacaaact cgatgcgata aatacagatgc ttcatatata tctacctaaa | 360 |
| atcacatcta tgttaagtga tgtaatgaag caaaattatg cgctaagtct gcaagtagaa | 420 |
| tacttaagta aacaattgaa agaaatttct gataaattag atgttattaa cgtaaattgtt | 480 |
| cttattaact ctacacttac tgaaattaca cctgcataatc aacggattaa atatgtaaat | 540 |
| gaaaaatttg aagaattaac ttttgctaca gaaaccactt taaaagtaaa aaaggatagc | 600 |
| tcgcctgctg atattcttga cgagttaact gaattaactg aactagcgaa aagtgttaca | 660 |
| aaaaatgacg tggatgggtt tgaattttac cttaatatcat tccacgatgt aatggtagga | 720 |
| aataatttat tcgggcgttc agctttaaaa actgcttcag aattaattgc taaagaaaat | 780 |
| gtgaaaacaa gtggcagtga agtaggaaat gtttataatt tcttaattgt attaacagct | 840 |
| ctacaagcaa aagcttttct tactttaaca acatgccgaa aattattagg cttagcagat | 900 |
| attgattata catctattat gaatgaacat ttaaataagg aaaagagga atttagagta | 960 |
| aacatccttc ctacactttc taatactttt tctaactcta attatgcaaa agttaagga | 1020 |
| agtgatgaag atgcaaagat gattgtggaa gctaaaccag gacatgcatt ggttgggtt | 1080 |
| gaaattagta atgattcaat gacagtatta aaagtatatg aagctaagct aaaacaaaat | 1140 |
| taccaagttg ataaggattc cttatcgga gtcatttata gtgatatgga taaattattg | 1200 |
| tgcccagatc aatctgaaca aatttattat acaaataata tagtatttcc aatgaatat | 1260 |
| gtaattacta aaattgattt tactaagaaa atgaaaactt taagatatga ggtaacagct | 1320 |
| aattcttacg attcttctac aggagaaatt gacttaaata agaagaaagt agaatcaagt | 1380 |
| gaagcggagt ataggacgtt aagtgcta atgatggag tatatatgcc gttaggtgtc | 1440 |
| atcagtgaaa catttttgac tccaattaat ggatttggcc tccaagctga tgaaaattca | 1500 |
| agattaatta ctttaacatg taaatcatat ttaagggaac tactactagc gacagactta | 1560 |
| agcaataaag aaactaaatt gattgtcccg cctattagtt ttattagtaa tattgtagaa | 1620 |
| aatgggaact tagagggaga aaacttagag ccgtggatag caaataacaa aatgcgtat | 1680 |
| gtagatcata caggtggtat aaatggaact aaagttttat atgttcataa ggatggtgag | 1740 |
| ttttcacaat ttgttggagg taagttaaaa tcgaaaacag aatatgtaat tcaatatatt | 1800 |
| gtaaagggaa aagcttctat ttatttataaaa gataaaaaaa atgagaattc catttatgaa | 1860 |

gaaataaata atgatttaga aggttttcaa actgttacta aacgttttat tacaggaacg 1920
 gattcttcag ggattcattt aatttttacc agtcaaaatg gcgagggagc atttgaggga 1980
 aactttatta tctcagaaat taggacatcc gaagagttat taagtccaga attgattatg 2040
 tcggatgctt ggggttgatc ccagggaact tggatctcag gaaattctct cactattaat 2100
 agtaatgtaa atggaacctt tcgacaaaat cttccgttag aaagttattc aacctatagt 2160
 atgaacttta ctgtgaatgg atttggaag gtgacagtaa gaaattctcg tgaagtatta 2220
 tttgaaaaaa gttatccgca gctttcacct aaagatattt ctgaaaaatt tacaactgca 2280
 gccataata ccggattata tgtagagctt tctcgctcaa cgtcgggtgg tgcaataaat 2340
 ttccgagatt tttcaattaa gtaa 2364

<210> 25
 <211> 787
 <212> PRT
 <213> *Bacillus thuringiensis*

<400> 25

Met Asn Met Asn Asn Thr Lys Leu Asn Ala Arg Ala Leu Pro Ser Phe
1 5 10 15

Ile Asp Tyr Phe Asn Gly Ile Tyr Gly Phe Ala Thr Gly Ile Lys Asp
20 25 30

Ile Met Asn Met Ile Phe Lys Thr Asp Thr Gly Gly Asn Leu Thr Leu
35 40 45

Asp Glu Ile Leu Lys Asn Gln Gln Leu Leu Asn Glu Ile Ser Gly Lys
50 55 60

Leu Asp Gly Val Asn Gly Ser Leu Asn Asp Leu Ile Ala Gln Gly Asn
65 70 75 80

Leu Asn Thr Glu Leu Ser Lys Glu Ile Leu Lys Ile Ala Asn Glu Gln
85 90 95

Asn Gln Val Leu Asn Asp Val Asn Asn Lys Leu Asp Ala Ile Asn Thr
100 105 110

Met Leu His Ile Tyr Leu Pro Lys Ile Thr Ser Met Leu Ser Asp Val
115 120 125

Met Lys Gln Asn Tyr Ala Leu Ser Leu Gln Val Glu Tyr Leu Ser Lys
 130 135 140

Gln Leu Lys Glu Ile Ser Asp Lys Leu Asp Val Ile Asn Val Asn Val
 145 150 155 160

Leu Ile Asn Ser Thr Leu Thr Glu Ile Thr Pro Ala Tyr Gln Arg Ile
 165 170 175

Lys Tyr Val Asn Glu Lys Phe Glu Glu Leu Thr Phe Ala Thr Glu Thr
 180 185 190

Thr Leu Lys Val Lys Lys Asp Ser Ser Pro Ala Asp Ile Leu Asp Glu
 195 200 205

Leu Thr Glu Leu Thr Glu Leu Ala Lys Ser Val Thr Lys Asn Asp Val
 210 215 220

Asp Gly Phe Glu Phe Tyr Leu Asn Thr Phe His Asp Val Met Val Gly
 225 230 235 240

Asn Asn Leu Phe Gly Arg Ser Ala Leu Lys Thr Ala Ser Glu Leu Ile
 245 250 255

Ala Lys Glu Asn Val Lys Thr Ser Gly Ser Glu Val Gly Asn Val Tyr
 260 265 270

Asn Phe Leu Ile Val Leu Thr Ala Leu Gln Ala Lys Ala Phe Leu Thr
 275 280 285

Leu Thr Thr Cys Arg Lys Leu Leu Gly Leu Ala Asp Ile Asp Tyr Thr
 290 295 300

Ser Ile Met Asn Glu His Leu Asn Lys Glu Lys Glu Glu Phe Arg Val
 305 310 315 320

Asn Ile Leu Pro Thr Leu Ser Asn Thr Phe Ser Asn Pro Asn Tyr Ala
 325 330 335

Lys Val Lys Gly Ser Asp Glu Asp Ala Lys Met Ile Val Glu Ala Lys
 340 345 350

Pro Gly His Ala Leu Val Gly Phe Glu Ile Ser Asn Asp Ser Met Thr
 355 360 365

Val Leu Lys Val Tyr Glu Ala Lys Leu Lys Gln Asn Tyr Gln Val Asp
 370 375 380

Lys Asp Ser Leu Ser Glu Val Ile Tyr Ser Asp Met Asp Lys Leu Leu
 385 390 395 400

Cys Pro Asp Gln Ser Glu Gln Ile Tyr Tyr Thr Asn Asn Ile Val Phe
 405 410 415

Pro Asn Glu Tyr Val Ile Thr Lys Ile Asp Phe Thr Lys Lys Met Lys
 420 425 430

Thr Leu Arg Tyr Glu Val Thr Ala Asn Ser Tyr Asp Ser Ser Thr Gly
 435 440 445

Glu Ile Asp Leu Asn Lys Lys Lys Val Glu Ser Ser Glu Ala Glu Tyr
 450 455 460

Arg Thr Leu Ser Ala Asn Asn Asp Gly Val Tyr Met Pro Leu Gly Val
 465 470 475 480

Ile Ser Glu Thr Phe Leu Thr Pro Ile Asn Gly Phe Gly Leu Gln Ala
 485 490 495

Asp Glu Asn Ser Arg Leu Ile Thr Leu Thr Cys Lys Ser Tyr Leu Arg
 500 505 510

Glu Leu Leu Leu Ala Thr Asp Leu Ser Asn Lys Glu Thr Lys Leu Ile
 515 520 525

Val Pro Pro Ile Ser Phe Ile Ser Asn Ile Val Glu Asn Gly Asn Leu
 530 535 540

Glu Gly Glu Asn Leu Glu Pro Trp Ile Ala Asn Asn Lys Asn Ala Tyr
 545 550 555 560

Val Asp His Thr Gly Gly Ile Asn Gly Thr Lys Val Leu Tyr Val His
 565 570 575

Lys Asp Gly Glu Phe Ser Gln Phe Val Gly Gly Lys Leu Lys Ser Lys
 580 585 590

Thr Glu Tyr Val Ile Gln Tyr Ile Val Lys Gly Lys Ala Ser Ile Tyr
 595 600 605

Leu Lys Asp Lys Lys Asn Glu Asn Ser Ile Tyr Glu Glu Ile Asn Asn
 610 615 620

Asp Leu Glu Gly Phe Gln Thr Val Thr Lys Arg Phe Ile Thr Gly Thr
 625 630 635 640

Asp Ser Ser Gly Ile His Leu Ile Phe Thr Ser Gln Asn Gly Glu Gly
 645 650 655

Ala Phe Gly Gly Asn Phe Ile Ile Ser Glu Ile Arg Thr Ser Glu Glu
 660 665 670

Leu Leu Ser Pro Glu Leu Ile Met Ser Asp Ala Trp Val Gly Ser Gln
 675 680 685

Gly Thr Trp Ile Ser Gly Asn Ser Leu Thr Ile Asn Ser Asn Val Asn
 690 695 700

Gly Thr Phe Arg Gln Asn Leu Pro Leu Glu Ser Tyr Ser Thr Tyr Ser
 705 710 715 720

Met Asn Phe Thr Val Asn Gly Phe Gly Lys Val Thr Val Arg Asn Ser
 725 730 735

Arg Glu Val Leu Phe Glu Lys Ser Tyr Pro Gln Leu Ser Pro Lys Asp
 740 745 750

Ile Ser Glu Lys Phe Thr Thr Ala Ala Asn Asn Thr Gly Leu Tyr Val
 755 760 765

Glu Leu Ser Arg Ser Thr Ser Gly Gly Ala Ile Asn Phe Arg Asp Phe
 770 775 780

Ser Ile Lys
 785

<210> 26

<211> 2367

<212> DNA

<213> *Bacillus thuringiensis*

<400> 26

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| atggctaaca tgaacaacac caagctcaac gcccgcgccc tcccatcctt cattgactac | 60 |
| ttcaacggca tctacggctt cgccactggc atcaaggaca tcatgaacat gatcttcaag | 120 |
| actgacactg gtggcaacct caccttggat gagatcctca agaaccagca gtcctcaac | 180 |
| gagatctctg gcaagttgga tgggtgtcaac ggctccctca acgacctcat tgcccagggc | 240 |
| aacctcaaca ctgagctttc caaggagatc ctcaaaattg ccaacgagca gaaccaggtc | 300 |
| ctcaacgatg tcaacaacaa gttggatgcc atcaacacca tgctccacat ctatctccca | 360 |
| aaaatcacct ccatgctctc tgatgtcatg aagcagaact acgccctctc cctccaagt | 420 |
| gagtacctct ccaagcagct caaggaaatt tctgacaagt tggatgtgat caacgtcaac | 480 |
| gtcctcatca actccaccct cactgagatc actccagcct atcagaggat caagtacgtc | 540 |
| aacgagaagt tcgaggagct tactttcgcc actgagacca ccctcaaggc caagaaggac | 600 |
| tccagcccag ctgacatctt ggatgagctt actgagctta ctgagttggc caagtctgtc | 660 |
| accaagaacg atgtggatgg cttcgagttc tacctcaaca ccttccacga tgtcatggtg | 720 |
| ggcaacaact tgttcggccg ttctgccttc aagactgcct ctgaattgat cgcaaaggag | 780 |
| aacgtcaaga cctctggctc tgagggtgggc aacgtctaca acttctcat tgtcctcact | 840 |
| gccctccaag ccaaggcctt cctcaccctc accacctgtc gtaagctctt gggcttggct | 900 |
| gacattgact acacctccat catgaacgag cacctcaaca aggagaagga ggagttccgt | 960 |
| gtcaacatcc tcccaaccct ctccaacacc ttctccaacc caaactacgc caaggtcaag | 1020 |
| ggctctgatg aggatgcaa gatgattgtg gaggccaagc ccggccacgc ccttgtgggc | 1080 |
| ttcgagatct ccaacgactc catgactgtc ctcaaggtct acgaggccaa gctcaagcag | 1140 |
| aactaccagg tggacaagga ctccctctcc gaggtcatct actccgacat ggacaagctc | 1200 |
| ctctgcccag accagtccga gcagatctac tacaccaaca acatcgtgtt cccaaacgag | 1260 |
| tacgtcatca ccaaaaattga cttcaccaag aagatgaaaa ccctccgtta cgaggtcact | 1320 |
| gccaactcct acgactcctc cactgggtgag attgacctca acaagaagaa ggtggagtcc | 1380 |
| tctgaggctg agtaccgtac cctctctgcc aacaacgatg gtgtctacat gcccttgggt | 1440 |
| gtgatctctg agaccttctt cactcctatc aacggtttctg gcctccaagc tgatgaaaat | 1500 |
| tcacgtctca tcacctcac ttgtaagtcc tatctcaggg agttgctctt ggccactgac | 1560 |

ctctccaaca aggagaccaa gctcattgtc ccacccatct ccttcatctc caacattgtg 1620
 gagaacggca acttggaggg tgagaacttg gagccttggg ttgccaacaa caagaacgcc 1680
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 gaggagatca acaacgactt ggagggcttc cagactgtca ccaagagggt catcactggc 1920
 actgactcct ctggcatcca cctcatcttc acctccaga acggtgaggg tgctttcggg 1980
 ggcaacttca taatctctga gatcaggacc tctgaggagc ttctctctcc cgagcttata 2040
 atgtctgatg cctgggttgg ctcccagggc acttggatct ctggcaactc cctcaccatc 2100
 aactccaacg tcaacggcac ctcccgccag aacctcccat tggagtcta ctccacctac 2160
 tccatgaact tcaactgtcaa cggtttcggc aaggtcactg tcaggaactc ccgtgaggtc 2220
 ctcttcgaga agtcctaccc acagctctct cccaaggaca tctctgagaa gttcaccact 2280
 gctgccaaca aactggcct ctacgtggag ctttcccggt ccacctctgg tggtgccatc 2340
 aacttccgtg acttctccat caagtga 2367

<210> 27
 <211> 788
 <212> PRT
 <213> *Bacillus thuringiensis*

<400> 27

Met Ala Asn Met Asn Asn Thr Lys Leu Asn Ala Arg Ala Leu Pro Ser
 1 5 10 15

Phe Ile Asp Tyr Phe Asn Gly Ile Tyr Gly Phe Ala Thr Gly Ile Lys
 20 25 30

Asp Ile Met Asn Met Ile Phe Lys Thr Asp Thr Gly Gly Asn Leu Thr
 35 40 45

Leu Asp Glu Ile Leu Lys Asn Gln Gln Leu Leu Asn Glu Ile Ser Gly
 50 55 60

Lys Leu Asp Gly Val Asn Gly Ser Leu Asn Asp Leu Ile Ala Gln Gly
 65 70 75 80

Asn Leu Asn Thr Glu Leu Ser Lys Glu Ile Leu Lys Ile Ala Asn Glu
 85 90 95

Gln Asn Gln Val Leu Asn Asp Val Asn Asn Lys Leu Asp Ala Ile Asn
 100 105 110

Thr Met Leu His Ile Tyr Leu Pro Lys Ile Thr Ser Met Leu Ser Asp
 115 120 125

Val Met Lys Gln Asn Tyr Ala Leu Ser Leu Gln Val Glu Tyr Leu Ser
 130 135 140

Lys Gln Leu Lys Glu Ile Ser Asp Lys Leu Asp Val Ile Asn Val Asn
 145 150 155 160

Val Leu Ile Asn Ser Thr Leu Thr Glu Ile Thr Pro Ala Tyr Gln Arg
 165 170 175

Ile Lys Tyr Val Asn Glu Lys Phe Glu Glu Leu Thr Phe Ala Thr Glu
 180 185 190

Thr Thr Leu Lys Val Lys Lys Asp Ser Ser Pro Ala Asp Ile Leu Asp
 195 200 205

Glu Leu Thr Glu Leu Thr Glu Leu Ala Lys Ser Val Thr Lys Asn Asp
 210 215 220

Val Asp Gly Phe Glu Phe Tyr Leu Asn Thr Phe His Asp Val Met Val
 225 230 235 240

Gly Asn Asn Leu Phe Gly Arg Ser Ala Leu Lys Thr Ala Ser Glu Leu
 245 250 255

Ile Ala Lys Glu Asn Val Lys Thr Ser Gly Ser Glu Val Gly Asn Val
 260 265 270

Tyr Asn Phe Leu Ile Val Leu Thr Ala Leu Gln Ala Lys Ala Phe Leu
 275 280 285

Thr Leu Thr Thr Cys Arg Lys Leu Leu Gly Leu Ala Asp Ile Asp Tyr
 290 295 300

Thr Ser Ile Met Asn Glu His Leu Asn Lys Glu Lys Glu Glu Phe Arg
305 310 315 320

Val Asn Ile Leu Pro Thr Leu Ser Asn Thr Phe Ser Asn Pro Asn Tyr
325 330 335

Ala Lys Val Lys Gly Ser Asp Glu Asp Ala Lys Met Ile Val Glu Ala
340 345 350

Lys Pro Gly His Ala Leu Val Gly Phe Glu Ile Ser Asn Asp Ser Met
355 360 365

Thr Val Leu Lys Val Tyr Glu Ala Lys Leu Lys Gln Asn Tyr Gln Val
370 375 380

Asp Lys Asp Ser Leu Ser Glu Val Ile Tyr Ser Asp Met Asp Lys Leu
385 390 395 400

Leu Cys Pro Asp Gln Ser Glu Gln Ile Tyr Tyr Thr Asn Asn Ile Val
405 410 415

Phe Pro Asn Glu Tyr Val Ile Thr Lys Ile Asp Phe Thr Lys Lys Met
420 425 430

Lys Thr Leu Arg Tyr Glu Val Thr Ala Asn Ser Tyr Asp Ser Ser Thr
435 440 445

Gly Glu Ile Asp Leu Asn Lys Lys Lys Val Glu Ser Ser Glu Ala Glu
450 455 460

Tyr Arg Thr Leu Ser Ala Asn Asn Asp Gly Val Tyr Met Pro Leu Gly
465 470 475 480

Val Ile Ser Glu Thr Phe Leu Thr Pro Ile Asn Gly Phe Gly Leu Gln
485 490 495

Ala Asp Glu Asn Ser Arg Leu Ile Thr Leu Thr Cys Lys Ser Tyr Leu
500 505 510

Arg Glu Leu Leu Leu Ala Thr Asp Leu Ser Asn Lys Glu Thr Lys Leu
515 520 525

Ile Val Pro Pro Ile Ser Phe Ile Ser Asn Ile Val Glu Asn Gly Asn
 530 535 540

Leu Glu Gly Glu Asn Leu Glu Pro Trp Ile Ala Asn Asn Lys Asn Ala
 545 550 555 560

Tyr Val Asp His Thr Gly Gly Ile Asn Gly Thr Lys Val Leu Tyr Val
 565 570 575

His Lys Asp Gly Glu Phe Ser Gln Phe Val Gly Gly Lys Leu Lys Ser
 580 585 590

Lys Thr Glu Tyr Val Ile Gln Tyr Ile Val Lys Gly Lys Ala Ser Ile
 595 600 605

Tyr Leu Lys Asp Lys Lys Asn Glu Asn Ser Ile Tyr Glu Glu Ile Asn
 610 615 620

Asn Asp Leu Glu Gly Phe Gln Thr Val Thr Lys Arg Phe Ile Thr Gly
 625 630 635 640

Thr Asp Ser Ser Gly Ile His Leu Ile Phe Thr Ser Gln Asn Gly Glu
 645 650 655

Gly Ala Phe Gly Gly Asn Phe Ile Ile Ser Glu Ile Arg Thr Ser Glu
 660 665 670

Glu Leu Leu Ser Pro Glu Leu Ile Met Ser Asp Ala Trp Val Gly Ser
 675 680 685

Gln Gly Thr Trp Ile Ser Gly Asn Ser Leu Thr Ile Asn Ser Asn Val
 690 695 700

Asn Gly Thr Phe Arg Gln Asn Leu Pro Leu Glu Ser Tyr Ser Thr Tyr
 705 710 715 720

Ser Met Asn Phe Thr Val Asn Gly Phe Gly Lys Val Thr Val Arg Asn
 725 730 735

Ser Arg Glu Val Leu Phe Glu Lys Ser Tyr Pro Gln Leu Ser Pro Lys
 740 745 750

Asp Ile Ser Glu Lys Phe Thr Thr Ala Ala Asn Asn Thr Gly Leu Tyr
755 760 765

Val Glu Leu Ser Arg Ser Thr Ser Gly Gly Ala Ile Asn Phe Arg Asp
770 775 780

Phe Ser Ile Lys
785